

Subject: ANALOG ELECTRONICS

Time: 3 Hours

Max. Marks: 100

DECEMBER 2010

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after half an hour of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. The most commonly used transistor circuit configuration is

- (A) common base (B) common emitter
(C) common collector (D) none of these

b. The FET is characterised by

- (A) voltage gain (B) current gain.
(C) power gain (D) none of these

c. When no signal is applied, the approximate collector efficiency of a class A power amplifier is

- (A) 10 % (B) 50 %
(C) 25 % (D) 0 %.

d. The input impedance of an ideal op-amp is

- (A) finite (B) zero
(C) infinite (D) unity

e. The slew rate is expressed as

- (A) $2 \pi f V_m / 10^6$ (B) $2 \pi f 10^6 / V_m$
(C) $V_m 10^6 / 2 \pi f$ (D) $2 \pi f / V_m 10^6$

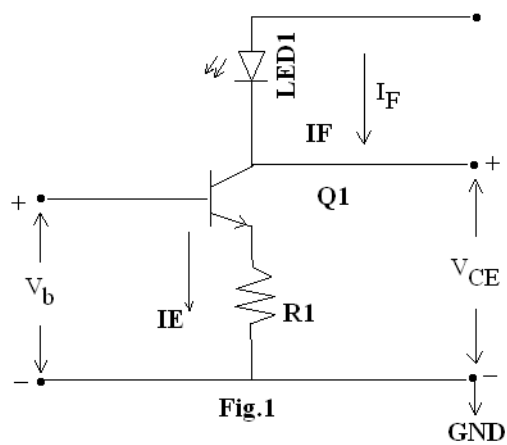
f. The instrumentation amplifier having an important feature of

- (A) high output impedance (B) low output impedance
(C) high dc offset voltage (D) low CMMR

- g. In a multivibrator, we have _____ feedback
- (A) 100% positive (B) both positive and negative
(C) negative (D) none of these
- h. In the diffused resistor method, the sheet resistance R_s can be expressed in terms of surface dimensions L , W and diffused resistor R as
- (A) RL/W (B) RW/L
(C) W/RL (D) RWL
- i. In the common mode configuration, gain is
- (A) very high (B) always infinite
(C) always unity (D) very low
- j. IC 723 General purpose regulator has following limitations
- (A) no short circuit protection (B) output voltage is fixed
(C) no inbuilt thermal protection (D) none of these

**Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.**

- Q.2** a. List the basic processes used in the silicon planar technology, and describe the oxidation process in detail. (8)
- b. Discuss the various ways for fabricating PNP transistor. (8)
- Q.3** a. Draw an h-parameter equivalent circuit for the CB unbypassed base bias configuration and briefly explain the component of the model. (8)
- b. A CE amplifier having the following h parameters $h_{ie} = 1100\Omega$, $h_{oe} = 25\mu S$, $h_{fe} = 50$ and $h_{re} = 2.5 \times 10^{-4}$, if load and source resistances are $1\text{ K}\Omega$. Find current and voltage gain. (8)
- Q.4** a. Draw the transfer characteristics of a FET and show that the gate source voltage increases with decrease in drain current. (8)
- b. A JFET has a drain current of 5mA , I_{DSS} of 10mA and gate source cut off Voltage $V_{GS(off)} = -6\text{V}$, find the values of (i) V_{GS} and (ii) V_P (8)
- Q.5** a. Draw the circuit diagram of transformer-coupled class A amplifier and derive an expression for relation between reflected load and the secondary load. (8)
- b. The LED in the circuit shown in Fig.1 is to pass a 20mA current. The circuit voltages are $V_{CC} = 15\text{V}$, $V_{BE} = 0.7\text{V}$, $V_F = 1.9\text{V}$ and $V_B = 5\text{V}$. Determine a suitable resistance value for R_1 and calculate V_{CE} for Q_1 . (8)



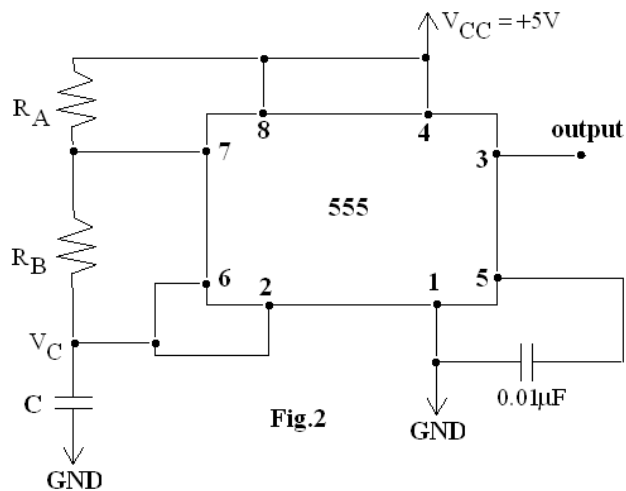
- Q.6** a. Describe the following DC characteristics of op-amp. (8)
- (i) Input offset voltage
 - (ii) Input offset current
 - (iii) Input bias current
 - (iv) Thermal drift

b. Describe the operation of voltage follower using op-amp. Why it is also called as non-inverting buffer amplifier. (8)

- Q.7** a. Draw the circuit of op-amp integrator and derive an expression for the output voltage. (8)

b. A non inverting summing amplifier having three resistances at non inverting terminal are $R_1 = R_2 = R_3 = 1K\Omega$, the feedback resistance is of $2K\Omega$. The input sources connected at the non-inverting terminals are of $V_a = 3V, V_b = 4V$ and $V_c = -1V$, find the output voltage (V_o). (8)

- Q.8** a. Describe the operation of astable multivibrator using IC555 as shown in Fig. 2 and find the frequency of oscillation and duty cycle if $R_A = 6.8 K\Omega, R_B = 3.3 K\Omega$ and $C = 0.1\mu F$. (8)



b. List the important Describe any one circuit in detail. (8)

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- Q.9** a. Draw the connection diagram of three pin adjustable voltage regulator (LM317). Find the value of input set resistor R_1 and output set resistor R_2 . The output voltage $V_o=5V$, output current $I_o=1.0A$, adjustment pin current $I_Q=100\mu A$ and the voltage between output and reference terminal is $V_R = 1.25V$, $I_{R1} = 5mA$. (8)
- b. Draw the functional diagram of ADC and list out the names and applications of commonly used ADCs. (8)